CLAIMS

I claim:

1   1.   A high speed multiplier comprising a folding multiplier configured to fold

2   multiplicands and multipliers where individual ones of said multiplicands and multipliers

3   exceed a folding threshold, said folding multiplier computing a product of said

4   multiplicands and multipliers based on less than all bits comprising said multiplicands

5   and multipliers.

1   2.   The high speed multiplier of claim 1, further comprising a conventional multiplier

2   and at least one additional folding multiplier, each of said multipliers being individually,

3   selectably activatable.

1   3.   A folding multiplication method for reducing power dissipation when multiplying a

2   multiplicand and multiplier in a computing device, said method comprising the steps of:

3   identifying a folding threshold below which multiplicands and multipliers, when

4   multiplied, cause less power dissipation than that which would be caused in a

5   conventional multiplication;

6   determining whether either of the multiplicand or the multiplier exceed said

7   folding threshold, and establishing a first non-zero scaling factor for the multiplicand if

8   the multiplicand exceeds said folding threshold, and a second non-zero scaling factor

9   for the multiplier if the multiplier exceeds said folding threshold;

10   averaging the multiplicand and multiplier and computing a value equivalent to

11   one-half of the difference of the multiplicand and multiplier;

12   squaring a first operand, said first operand being equal to said average less a

13   fractional portion of said first scaling factor, squaring a second operand, said second

14   operand being equal to said computation value less a fractional portion of said second

15   scaling factor, squaring a third operand, said third operand being equal to said fractional

16   portion of said first scaling factor, and squaring a fourth operand, said fourth operand

17   being equal to said fractional portion of said second scaling factor;

18   multiplying said first scaling factor by said average, said multiplication resulting in

19   a first product, and further multiplying said second scaling factor by said computed

20   value, said further multiplication resulting in a second product; and,

21   summing said squared first operand, said first product and said squared fourth

22   operand, and subtracting from said sum, said squared second operand, said second

23   product and said squared third operand, said subtraction producing a folded product.

1   4.   The folding method of claim 3, further comprising performing said squaring of

2   said first operand and said multiplication using a value of zero for said first scaling factor

3   only if said average evaluates equal to or below said folding threshold, and performing

4   said squaring of said second operand and said further multiplication using a value of

5   zero for said second scaling factor only if said computed value evaluates equal to or

6   below said folding threshold.

7   5.   A machine readable storage having stored thereon a computer program, said

8   computer program comprising a routine set of instructions for causing the machine to

9   perform the steps of:

10   identifying a folding threshold below which multiplicands and multipliers, when

11   multiplied, cause less power dissipation than that which would be caused in a

12   conventional multiplication;

13   determining whether either of the multiplicand or the multiplier exceed said

14   folding threshold, and establishing a first non-zero scaling factor for the multiplicand if

15   the multiplicand exceeds said folding threshold, and a second non-zero scaling factor

16   for the multiplier if the multiplier exceeds said folding threshold;

17   averaging the multiplicand and multiplier and computing a value equivalent to

18   one-half of the difference of the multiplicand and multiplier;

19   squaring a first operand, said first operand being equal to said average less a

20   fractional portion of said first scaling factor, squaring a second operand, said second

21   operand being equal to said computation value less a fractional portion of said second

22   scaling factor, squaring a third operand, said third operand being equal to said fractional

23   portion of said first scaling factor, and squaring a fourth operand, said fourth operand

24   being equal to said fractional portion of said second scaling factor;

25   multiplying said first scaling factor by said average, said multiplication resulting in

26   a first product, and further multiplying said second scaling factor by said computed

27   value, said further multiplication resulting in a second product; and,

28   summing said squared first operand, said first product and said squared fourth

29   operand, and subtracting from said sum, said squared second operand, said second

30   product and said squared third operand, said subtraction producing a folded product.

1   6.   The machine readable storage of claim 5, further comprising performing said

2   squaring of said first operand and said multiplication using a value of zero for said first

3   scaling factor only if said average evaluates equal to or below said folding threshold,

4   and performing said squaring of said second operand and said further multiplication

5   using a value of zero for said second scaling factor only if said computed value

6   evaluates equal to or below said folding threshold.